

Practice: 374 - Farmstead Energy Improvement**Scenario: #1 - Ventilation - Exhaust****Scenario Description:**

Replacement of an exhaust fan with a more efficient exhaust fan. Payment includes fan, controls, wiring, associated appurtenances and labor to install.

Before Situation:

Inefficient ventilation in an agricultural building.

After Situation:

High-efficiency ventilation system which reduces energy use. The new ventilation equipment will provide suitable air quality and reduce overall power requirements (kW) compared to the existing ventilation system as evidenced in an energy audit. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Each

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$1,300.95

Scenario Cost/Unit: \$1,300.95

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	3	\$89.52
Materials						
Fan, exhaust, 42" High Efficiency	1186	42 inch high efficiency exhaust fan, controls, wiring, and associated appurtenances. Materials only.	Each	\$1,491.04	0.25	\$372.76
Fan, exhaust, 48" High Efficiency	1187	48 inch high efficiency exhaust fan, controls, wiring, and associated appurtenances. Materials only.	Each	\$1,256.76	0.25	\$314.19
Fan, exhaust, 54" High Efficiency	1188	54 inch high efficiency exhaust fan, controls, wiring, and associated appurtenances. Materials only.	Each	\$1,015.28	0.25	\$253.82
Fan, exhaust, 36" High Efficiency	1185	36 inch high efficiency exhaust fan, controls, wiring, and associated appurtenances. Materials only.	Each	\$1,082.63	0.25	\$270.66

Practice: 374 - Farmstead Energy Improvement**Scenario: #2 - Ventilation - Horizontal Air Flow/Stir Fan****Scenario Description:**

A system of fans are installed where none exist to create a horizontal air circulation pattern, and remove air stratification. The new system promotes efficient heat and moisture distribution. Payment includes fan controls, wiring, associated appurtenances and labor to install.

Before Situation:

Inefficient air circulation system in a greenhouse or livestock house

After Situation:

High-efficiency air circulation system which reduces energy use. In a typical 10,000 square foot greenhouse, 10 HAF fans are needed. The new equipment will provide suitable air quality and reduce overall power requirements (kW) compared to the existing system as evidenced in an energy audit. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Each

Scenario Unit: Each

Scenario Typical Size: 4

Scenario Cost: \$820.92

Scenario Cost/Unit: \$205.23

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Fan, HAF, 1/10 to 1/15 HP	1189	High efficiency Horizontal Air Flow (HAF) fan, controls, wiring, and associated appurtenances. Materials only.	Each	\$145.55	4	\$582.20

Practice: 374 - Farmstead Energy Improvement**Scenario: #3 - Ventilation - Cool Cell, Evaporative Cooling System****Scenario Description:**

A cool cell evaporative cooling system is installed in a livestock barn to reduce total ventilation requirements in hot weather. Scenario is applicable where there is an existing, inefficient cooling system/ventilation system in place that will be replaced by the cool cell. Payment includes all materials and labor to install the evaporative cooling system.

Before Situation:

Inefficient ventilation temperature control in a poultry or livestock house

After Situation:

A cool cell evaporative cooling system reduces energy use by allowing lower ventilation rates that will result in net energy savings. The new equipment will provide suitable air quality and reduce overall power requirements (kW) compared to the existing system as evidenced in an energy audit. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Square Foot

Scenario Unit: Square Foot

Scenario Typical Size: 520

Scenario Cost: \$14,008.24

Scenario Cost/Unit: \$26.94

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	96	\$2,864.64
Materials						
Evaporative Cooling System, Large	2400	Energy efficient cooling systems installed in ventilated livestock confinement or greenhouses for temperature control. Complete system with cooling pads, aluminum distribution and end panels, 1/3 HP submersible sump pump and plumbing kit. Greater than 9	Square Foot	\$21.43	520	\$11,143.60

Practice: 374 - Farmstead Energy Improvement**Scenario: #4 - Refrigeration - Plate Cooler****Scenario Description:**

The installation of all stainless steel dual pass plate cooler, type 316 stainless steel. Payment includes plate cooler and labor to install.

Before Situation:

Inefficient milk cooling (minimal pre-cooling of milk before entering the bulk tank).

After Situation:

High-efficiency milk cooling system which reduces energy use. The new milk cooling equipment will pre-cool the milk and reduce overall power requirements (kW) compared to the existing milk cooling system (where most of the cooling was accomplished in the bulk tank) as evidenced in an energy audit. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672-Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Each

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$4,799.74

Scenario Cost/Unit: \$4,799.74

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Plate Cooler, ≤ 499 gal/hr capacity	1176	Stainless Steel, dual pass plate cooler with < 499 gallon/hour capacity. Includes materials and shipping only.	Each	\$4,561.02	1	\$4,561.02

Practice: 374 - Farmstead Energy Improvement**Scenario: #5 - Refrigeration - Scroll Compressor****Scenario Description:**

Install a new comparably sized scroll compressor, associated controls, wiring, and materials to retrofit an existing refrigeration system. A new condenser is not included in this typical scenario. Payment includes compressor, controls, wiring, appurtenances and labor to install.

Before Situation:

Inefficient reciprocating compressor as a key component of the refrigeration system used to cool milk. The compressor is a critical part of a milk cooling system, affecting milk quality, system reliability, and system efficiency.

After Situation:

A more efficient scroll compressor, which will reduce energy use, is evidenced by the energy audit. A comparably sized scroll compressor provides refrigeration capacity at a higher efficiency than a reciprocating compressor. Newer scroll compressor systems typically reduce electricity use by 15 to 25 percent compared to reciprocating compressors. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 5

Scenario Cost: \$2,714.60

Scenario Cost/Unit: \$542.92

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	4	\$119.36
Materials						
Scroll Compressor - 5 HP	1183	Scroll compressor, 5 Horsepower, controls, wiring, and appurtenances. Materials only.	Each	\$2,595.24	1	\$2,595.24

Practice: 374 - Farmstead Energy Improvement**Scenario: #6 - Refrigeration - Compressor Heat Recovery System****Scenario Description:**

Install a new comparably sized compressor heat recovery unit. The unit includes insulated storage tanks with heat exchangers added to a refrigeration system. The system utilizes the heat extracted from the fluid (e.g. milk) that passes through the hot gas refrigerant line from the refrigeration system's compressors, to pre-heat water to approximately 110°F before it enters a conventional water heater. Energy savings comes from the reduced heating required in a water heater. Low ambient controls and/or condenser variable speed drives are part of the installation. The actual number of heat recovery units and their location will depend on the operating hours of the compressor and the configuration of the existing system. Payment includes all materials and appurtenances and labor to install.

Before Situation:

Inefficient use of heat extracted from the milk during the cooling process

After Situation:

A more efficient compressor heat recovery system is installed, which will reduce energy use, is evidenced by the energy audit. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Each

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$3,605.12

Scenario Cost/Unit: \$3,605.12

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Compressor heat recovery (CHR) unit, High Efficiency	1899	Compressor heat recovery (CHR) units (insulated storage tanks with heat exchangers) added to a refrigeration system, use the heat extracted from a warm fluid (e.g., milk) that passes through the hot gas refrigerant line from the refrigeration system's co	Each	\$3,366.40	1	\$3,366.40

Practice: 374 - Farmstead Energy Improvement**Scenario: #7 - Controller - Variable Speed Drive for ≤1 HP Motor****Scenario Description:**

Installation of a variable speed drive (VSD) for a ≤1 horsepower electric motor typically used in small dairy operations. Payment includes appurtenances, such as hook-ups, control panels, wiring, control blocks, filters, switches, pads, etc. and labor to install. Payment does not include the cost of the motor.

Before Situation:

The system is inefficient when a motor operates at constant speed to satisfy a load which varies as to flow rate and/or pressure requirements.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a VSD to control electric motors. After the VSD is applied, the motor speed can be adjusted to reduce power requirements and better match varied flow or pressure requirements.

Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 1

Scenario Cost: \$4,043.44

Scenario Cost/Unit: \$4,043.44

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Variable Speed Drive, 1 HP	2347	Variable speed drive for 1 Horsepower electric motor. Does not include motor. Materials only.	Horsepower	\$3,804.72	1	\$3,804.72

Practice: 374 - Farmstead Energy Improvement**Scenario: #8 - Controller - Variable Speed Drive for >1 to <10 HP Motor****Scenario Description:**

Installation of a variable speed drive (VSD) for a >1 to <10 horsepower electric motor. Payment includes appurtenances, such as hook-ups, control panels, wiring, control blocks, filters, switches, pads, etc. and labor to install. Payment does not include the cost of the motor.

Before Situation:

The system is inefficient when a motor operates at constant speed to satisfy a load which varies as to flow rate and/or pressure requirements.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a VSD to control electric motors. After the VSD is applied, the motor speed can be adjusted to reduce power requirements and better match varied flow or pressure requirements. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 5

Scenario Cost: \$5,380.22

Scenario Cost/Unit: \$1,076.04

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Variable Speed Drive, 5 HP	2348	Variable speed drive for 5 Horsepower electric motor. Does not include motor. Materials only.	Horsepower	\$1,028.30	5	\$5,141.50

Practice: 374 - Farmstead Energy Improvement**Scenario: #9 - Controller - Variable Speed Drive for 10 to <50 HP Motor****Scenario Description:**

Installation of a variable speed drive (VSD) for a >10 to <50 horsepower electric motor typically used in small dairy operations. Payment includes appurtenances, such as hook-ups, control panels, wiring, control blocks, filters, switches, pads, etc. and labor to install. Payment does not include the cost of the motor.

Before Situation:

The system is inefficient when a motor operates at constant speed to satisfy a load which varies as to flow rate and/or pressure requirements.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a VSD to control electric motors. After the VSD is applied, the motor speed can be adjusted to reduce power requirements and better match varied flow or pressure requirements.

Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 10

Scenario Cost: \$7,025.52

Scenario Cost/Unit: \$702.55

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Variable Speed Drive, 10 HP	1287	Variable speed drive for 10 Horsepower electric motor. Does not include motor. Materials only.	Horsepower	\$678.68	10	\$6,786.80

Practice: 374 - Farmstead Energy Improvement**Scenario: #10 - Controller - Variable Speed Drive for ≥ 50 HP Motor****Scenario Description:**

Installation of a variable speed drive (VSD) for a ≥ 50 horsepower electric motor used to drive a ventilation fan, irrigation pumps, vacuum pump, or similar equipment involved with agricultural production. Payment includes appurtenances, such as hook-ups, control panels, wiring, control blocks, filters, switches, pads, etc. and labor to install.

Before Situation:

The system is inefficient when a motor operates at constant speed to satisfy a load which varies as to flow rate and/or pressure requirements.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a VSD to control electric motors. After the VSD is applied, the motor speed can be adjusted to reduce power requirements and better match varied flow or pressure requirements.

Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 100

Scenario Cost: \$12,346.72

Scenario Cost/Unit: \$123.47

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Variable Speed Drive, 100 HP	1289	Variable speed drive for 100 Horsepower electric motor. Does not include motor. Materials only.	Horsepower	\$121.08	100	\$12,108.00

Practice: 374 - Farmstead Energy Improvement**Scenario: #11 - Controller - Single Function Automatic Controller System****Scenario Description:**

The typical scenario consists of a single function automatic control system installed on an existing manually controlled agricultural system such as, but not limited to, irrigation systems or agricultural building control systems. Typical components may include any of the following: wiring, sensors, data logger, logic controller, communication link, software, switches, and relay. Payment includes materials and appurtenances and labor to install.

Before Situation:

A manually controlled system is existing in an agricultural facility that causes the inefficient use of energy, as evidenced by an on-farm energy audit.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of an automatic controller that helps regulates the energy consumption of the existing system. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Each system

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$1,412.90

Scenario Cost/Unit: \$1,412.90

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Switches and Controls, programmable controller	1193	Programmable logic controller (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$153.22	1	\$153.22
Switches and Controls, temp sensors	1192	Temperature and soil moisture sensors installed as part of an electronic monitoring (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$605.73	1	\$605.73
Switches and Controls, Wi-Fi system and software	1194	Software with built-in cellular or Wi-Fi communication commonly used to control pumps and irrigation systems	Each	\$415.23	1	\$415.23

Practice: 374 - Farmstead Energy Improvement**Scenario: #12 - Controller - Multiple Function Automatic Controller System****Scenario Description:**

The typical scenario consists of a multiple function automatic control system installed on an existing manually controlled agricultural system such as, but not limited to, agricultural building control systems. Typical components may include any of the following: wiring, sensors, data logger, logic controller, communication link, software, switches, and relay. Payment includes materials and appurtenances and labor to install.

Before Situation:

A manually controlled system is existing in an agricultural facility that causes the inefficient use of energy, as evidenced by an on-farm energy audit.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of an automatic controller that helps regulates the energy consumption of the existing system. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Each system

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$4,322.94

Scenario Cost/Unit: \$4,322.94

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	38	\$1,133.92
Materials						
Switches and Controls, temp sensors	1192	Temperature and soil moisture sensors installed as part of an electronic monitoring (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$605.73	4	\$2,422.92
Switches and Controls, programmable controller	1193	Programmable logic controller (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$153.22	5	\$766.10

Practice: 374 - Farmstead Energy Improvement**Scenario: #13 - Motor - ≤ 1 HP Electric Motor Upgrade****Scenario Description:**

Replacement of an existing electric motor with a upgraded electric motor typically used to drive a ventilation fan, irrigation pumps, vacuum pump, or similar equipment involved with agricultural production. The upgraded electric motor will be the same size as the existing less efficient motor it is replacing. This scenario is for motors ≤1 horsepower. Payment includes motor, appurtenances and labor to install.

Before Situation:

The system is inefficient with a standard efficiency motor.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a NEMA premium efficiency motor. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 1

Scenario Cost: \$572.27

Scenario Cost/Unit: \$572.27

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	4	\$119.36
Materials						
Motor, electric, NEMA Premium, 1 HP	1169	Premium NEMA approved electric motor, 1 Horsepower and all required appurtenances. Includes materials and shipping only.	Each	\$452.91	1	\$452.91

Practice: 374 - Farmstead Energy Improvement**Scenario: #14 - Motor - > 1 to <10 HP Electric Motor Upgrade****Scenario Description:**

Replacement of an existing electric motor with a upgraded electric motor typically used to drive a ventilation fan, irrigation pumps, vacuum pump, or similar equipment involved with agricultural production. The upgraded electric motor will be the same size as the existing less efficient motor it is replacing. This scenario is for motors ranging from >1 horsepower to <10 horsepower. Payment includes motor, appurtenances and labor to install.

Before Situation:

The system is inefficient with a standard efficiency motor.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a NEMA premium efficiency motor. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 5

Scenario Cost: \$858.66

Scenario Cost/Unit: \$171.73

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	4	\$119.36
Materials						
Motor, electric, NEMA Premium, 5 HP	1171	Premium NEMA approved electric motor, 5 Horsepower and all required appurtenances. Includes materials and shipping only.	Each	\$739.30	1	\$739.30

Practice: 374 - Farmstead Energy Improvement**Scenario: #15 - Motor - 10 - <50 HP Electric Motor Upgrade****Scenario Description:**

Replacement of an existing electric motor with a upgraded electric motor typically used to drive a ventilation fan, irrigation pumps, vacuum pump, or similar equipment involved with agricultural production. The upgraded electric motor will be the same size as the existing less efficient motor it is replacing. This scenario is for motors ranging from 10 horsepower to <50 horsepower. Payment includes motor, appurtenances and labor to install.

Before Situation:

The system is inefficient with a standard efficiency motor.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a NEMA premium efficiency motor. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 10

Scenario Cost: \$1,406.50

Scenario Cost/Unit: \$140.65

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	8	\$238.72
Materials						
Motor, electric, NEMA Premium, 10 HP	1172	Premium NEMA approved electric motor, 10 Horsepower and all required appurtenances. Includes materials and shipping only.	Each	\$1,167.78	1	\$1,167.78

Practice: 374 - Farmstead Energy Improvement**Scenario: #16 - Motor - ≥ 50 HP Electric Motor Upgrade****Scenario Description:**

Replacement of an existing electric motor with a upgraded electric motor typically used to drive a ventilation fan, irrigation pumps, vacuum pump, or similar equipment involved with agricultural production. The upgraded electric motor will be the same size as the existing less efficient motor it is replacing. This scenario is for motors of 50 horsepower or greater. Payment includes motor, appurtenances and labor to install.

Before Situation:

The system is inefficient with a standard efficiency motor.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a NEMA premium efficiency motor. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 100

Scenario Cost: \$7,854.32

Scenario Cost/Unit: \$78.54

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	16	\$477.44
Materials						
Motor, electric, NEMA Premium, 100 HP	1174	Premium NEMA approved electric motor, 100 Horsepower and all required appurtenances. Includes materials and shipping only.	Each	\$7,376.88	1	\$7,376.88

Practice: 374 - Farmstead Energy Improvement**Scenario: #17 - Motor - Variable Speed Electric (Split Phase)****Scenario Description:**

Installation of a multi speed electric motor typically used to drive a ventilation fan in a livestock production house. Payment includes motor and labor to install. Control panel is not included. Refer to associated control panel scenarios as needed.

Before Situation:

The system is inefficient when a motor operates at constant speed to satisfy a load which varies as to flow rate and/or pressure requirements.

After Situation:

An on-farm energy audit has determined that energy use can be reduced through use of a multi speed electric motor. After the motor is installed, the motor speed can be adjusted to reduce power requirements and better match varied flow or pressure requirements. Associated practices/activities: may include 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Horsepower

Scenario Unit: Horsepower

Scenario Typical Size: 1

Scenario Cost: \$217.29

Scenario Cost/Unit: \$217.29

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	3	\$89.52
Materials						
Motor, electric, Multi Speed, 10 HP	1154	Multi speed electric motor, 10 Horsepower maximum output and all required appurtenances. Materials only.	Horsepower	\$127.77	1	\$127.77

Practice: 374 - Farmstead Energy Improvement**Scenario: #18 - Heating - Radiant Systems****Scenario Description:**

Replace "pancake" Brood Heaters in a poultry house with Radiant Tube Heaters, or similar. Replacement will require the materials and labor to remove existing heating system, re-plumb gas lines, cables and winch system to retrofit new radiant tube heaters, and miscellaneous items to complete the installation. Alternate acceptable radiant heating systems can include radiant brooders and quad radiant systems as indicated in the energy audit. Payment includes materials and labor to install the new system.

Before Situation:

Inefficient heat distribution equipment, such as conventional "pancake" brood heaters. The Pancake brooder, mounted at a low installation height, primarily warms the air. They provide a one-to-two foot perimeter at desired temperatures around each brooder. A large number of brooders are required to cover a significant percent of floor space. As the warmed air naturally rises it loses effectiveness for poultry on the ground.

After Situation:

Energy use is reduced through installation of a more efficient heater. Radiant tube heaters primarily warm objects within a direct line of sight (similar to the sun or an open fire). Air temperature is of relatively little importance for a radiant heating system to be effective. As a result, radiant systems are typically installed 5' or more above the floor level. This height extends the distribution of the radiant heat over a larger area than is possible with pancake style heaters. A roughly 16' diameter radiant heat zone heats over twice that of a conventional pancake brooder. The typical scenario consists of the replacement of 28 brood heaters with 6 radiant tube heaters. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Rated Heat Output**Scenario Unit:** 1,000 BTU/Hour**Scenario Typical Size:** 125**Scenario Cost:** \$1,455.86**Scenario Cost/Unit:** \$11.65**Cost Details (by category):**

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	2	\$59.68
Materials						
Heater, radiant tube	1163	Radiant tube heater rated at 125,000 BTU/hour. Materials only.	Each	\$1,396.18	1	\$1,396.18

Practice: 374 - Farmstead Energy Improvement**Scenario: #19 - Heating - Building****Scenario Description:**

Replace existing low efficiency heaters with new high efficiency heaters. High-efficiency heating systems include any heating unit with efficiency rating of 80%+ for fuel oil and 90%+ for natural gas and propane. Applications may be air heating/building environment and hydronic (boiler) heating for agricultural operations, including under bench, or root zone heating. An alternative to heater replacement might be the addition of climate control system and electronic temperature controls with +/- 1 degree F differential, to reduce the annual run time. Payment includes heater and labor to install.

Before Situation:

Buildings heated with low efficiency heaters or heaters without proper electronic climate controls

After Situation:

Higher efficiency heaters reduce energy consumption, energy costs, and GHG emissions. These replacement systems can be fueled by natural gas, propane, or fuel oil. Associated practices/activities: 122-AgEMP - HQ 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Rated Heat Output

Scenario Unit: 1,000 BTU/Hour

Scenario Typical Size: 750

Scenario Cost: \$6,897.44

Scenario Cost/Unit: \$9.20

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	16	\$477.44
Materials						
Heater, high efficiency	1165	Natural gas, propane, or fuel oil unit heater or boiler and venting materials. Based on input kBTU/hour. Includes materials and shipping only.	1,000 BTU/Hour	\$8.56	750	\$6,420.00

Practice: 374 - Farmstead Energy Improvement**Scenario: #20 - Heating - Attic Heat Recovery Vents****Scenario Description:**

Install actuated inlets or automatic latching gravity inlets that draw warmer, drier air from the attic to assist with moisture and heat control when ventilation fans are being operated in poultry houses and swine barns. In certain situations it may be necessary to also upgrade the ventilation system in addition to the vent upgrades. Other systems to transfer heat, as detailed in ASABE S612-compliant energy audit may also be used. Payment includes materials and labor to install.

Before Situation:

Heated buildings with attic spaces but no means to transfer heat between the heated space, attic, and ambient (outside) air when relative conditions allow for reduced energy use.

After Situation:

Attic vents or inlets allow dry warm air from the attic to circulated throughout the building in a 40' x 500' poultry house. By using pre-warmed air from the attic less energy is needed for heating 122-AgEMP - HQ 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Each inlet

Scenario Unit: Each

Scenario Typical Size: 14

Scenario Cost: \$2,207.86

Scenario Cost/Unit: \$157.70

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	24	\$716.16
Materials						
Inlet, Attic Ceiling	2414	Poultry house attic air inlets. Includes materials only.	Each	\$106.55	14	\$1,491.70

Practice: 374 - Farmstead Energy Improvement**Scenario: #21 - Grain Dryer****Scenario Description:**

A more efficient replacement continuous dryer rated for the present dryer bushel/per hour capacity to treat existing energy concerns. The operation includes a microcomputer-based control system that adjusts the amount of time the crop remains in the dryer in order to achieve a consistent and accurate moisture content in the dried product. Alternate types of replacement dryers which reduce energy use are acceptable as defined by the energy audit. The upgraded grain dryer will be the same size as the existing less efficient grain dryer it is replacing. Payment includes materials and labor needed for the installation.

Before Situation:

Current grain dryer identified in the Agricultural Energy Management Plan is inefficient.

After Situation:

Energy use is reduced through installation of a more efficient continuous dryer that uses a microcomputer-based controller to reduce overdrying and total time of operation. The typical operation requires a rated capacity of 860 bushels per hour. Associated practices/activities may include: 122-AgEMP - HQ, 670- Lighting System Improvement, 672- Building Envelope Improvement, and other activities within 374-Farmstead Energy Improvement. The resource concern is inefficient use of energy in the farm operation which increases dependence on non-renewable energy sources and can be addressed through improved energy efficiency. Any improvements are based on a Type 2 energy audit meeting the requirements of ASABE S612.

Scenario Feature Measure: Rated capacity of the dryer

Scenario Unit: Bushel per Hour

Scenario Typical Size: 860

Scenario Cost: \$77,970.32

Scenario Cost/Unit: \$90.66

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$29.84	16	\$477.44
Materials						
Grain dryer, Centrifugal, 20'	1160	Grain dryer, 20 foot Centrifugal with rated capacity of 785 bushels/hour. Materials only.	Bushels per Hour	\$87.72	172	\$15,087.84
Grain dryer, Axial, 16'	1159	Grain dryer, 16 foot Axial with rated capacity of 600 bushels/hour. Materials only.	Bushels per Hour	\$82.01	172	\$14,105.72
Grain dryer, Centrifugal, 24'	1161	Grain dryer, 24 foot Centrifugal with rated capacity of 860 bushels/hr. Materials only.	Bushels per Hour	\$93.95	172	\$16,159.40
Grain dryer, Axial 28'	1162	Grain dryer, 28 foot Axial with rated capacity of 990 bushels/hr. Materials only.	Bushels per Hour	\$91.87	172	\$15,801.64
Grain dryer, Axial, 12'	1158	Grain dryer, 12 foot Axial with rated capacity of 460 bushels/hour. Materials only.	Bushels per Hour	\$94.99	172	\$16,338.28